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INCOSE
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INSIGHT

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INCOSE Winter Workshop Plans

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During the week of January 27, 1997, INCOSE officers, local leaders, technical committees, working groups, and administrative committees will meet at the annual Winter Workshop to spend a concentrated period working on INCOSE products and planning. The 1997 Workshop is jointly hosted by the Silver State and Inland Empire chapters, and will take place in Las Vegas, Nevada.

Some members will note the shift in title, starting last year, from "Winter Business Meeting" to "Winter Workshop." This shift accurately reflects a renewed focus on technical activities at the workshop, while retaining a parallel business agenda. Along with the annual symposium, the workshop represents one of two regularly scheduled opportunities to devote uninterrupted attention and time to the technical and administrative business of INCOSE. Activities include installation of new INCOSE officers, meetings of the Board of Directors, Corporate Advisory Board, Technical Board, and virtually all technical and administrative committees. We look forward to a productive workshop in Las Vegas, and will report on the activities and results in the next issue of ***INSIGHT***.

INSIDE THIS ISSUE

INCOSE Election Results

Shirley Bishop, incose@halcyon.com, Managing Executive, INCOSE

Here are the results of the INCOSE election (600 votes were counted):

President-Elect:	William W. Schoening *McDonnell Douglas*
Secretary:	William D. Miller, *AT&T*
Director-at-Large:	Brian McCay *Concept Five Technologies*
Director/I:	Ken Crowder *Boeing Defense & Space Group*
Director/II:	Elliot Axelband *University of Sou thern California*
Director/III:	Dorothy Kuhn, *MCI*
Director/IV:	Don Clausing, *MIT*
Director/V:	Harry Crisp *Naval Surface Warfare Center*
Directors/VI:	Robert Halligan *Technology Australasia Pty Ltd.*, and Peter Brook *Defense Research Agency*

Many thanks to all of you who participated in the vote!

President's Corner

Virginia A. Lentz (Ginny), lentzva@utrc.utc.com

January in Nevada-and the transfer of the INCOSE Gavel is a short time away! This year has passed far too quickly. It seems only yesterday, that we were in Melbourne (Florida, that is) trading T-shirts. Now, even though I'm on my third company, the one constant has been INCOSE.

I only made it to five Chapters, the INCOSE-UK Symposium, and the San Diego Mini-Conference. The emerging Hartford Chapter, with which I am now affiliated, needs a spark plug, and I look forward to helping there starting in February.

I'm not certain how the INCOSE numbers will work out in January. We may not make any of my goals but I'm not complaining. You all are doing so many things well: producing INCOSE documents, starting new working groups, and focusing on real issues such as the variations of systems engineering in the commercial marketplace.

Thank You! You made my year.

FEATURES

LESSONS LEARNED AS A PROGRAM CHAIR

Sarah A. Sheard, sheard@software.org

As I retire as the first (and so far, only) Program Chair of the Washington Metropolitan Area Chapter (WMA), I thought I would ruminate a bit on what I have learned during my three year stint, and pass it on.

■ GUIDING PRINCIPLE

If you have interesting programs, people will come. If you don't, they won't. And when programs are stimulating and helpful, members will have more interest in promoting the chapter in other ways. For example, thanks to strong leadership from Art Pyster, our 1996 elected officers and the Membership chair, Pat Riedinger, the WMA chapter has accomplished some phenomenal results, including the following:

- Holding WMA board meetings twice monthly (once immediately prior to each chapter meeting to touch bases and a longer meeting in between)
- Placing meeting announcements in local engineering papers (which requires 6 to 8 weeks of advance effort)
- Conducting on our first two tutorials (following the lead of the San Francisco Bay Area Chapter)
- Displaying and distributing INCOSE materials at local job fairs, and similar events
- Increasing chapter membership by 50 percent (over 100 members!) in eight months through the above efforts and by offering free meals to first-time chapter meeting attendees

■ LESSONS LEARNED AND RULES OF THUMB

I offer the following specific lessons learned and suggested rules of thumb:

- *Plan programs four to six months in advance.* Then confirm programs three months in advance. This allows plenty of time to place notices in newsletters, such as ***INSIGHT***, and in local papers.

- *Keep the same place, date, and time for monthly meetings.* We always meet in the same place (generously provided by Boeing), on the second Tuesday of the month, at 6:30 pm, catered by a lunch service in the building. The food is not gourmet, but catering is reliable, easy, and inexpensive.

- *Don't have a meeting in December.* Earlier, we had also canceled one summer meeting because of the annual INCOSE symposium and vacations. However, when we subsequently continued the regular meeting schedule through the summer, attendance was good.

- *Generate many program ideas:* Be creative. Ask chapter officers and members for ideas. Review proceedings for papers suggesting possible topics. Look through local college engineering and science department bulletins and announcements for interesting theses and publications. Seek fresh topics in professional and trade publications. Then proceed as follows:

  - Put the list of possible programs in a two-page survey, asking people to check off programs they would find interesting. (Don't ask for complex rankings or ratings: If you have as many ideas as you should, such detail will require too much effort of respondents, and they won't respond. A simple tally of items checked will provide plenty of information.)
  - Don't bother sending out surveys to non-attendees. I got only 15 percent response rate from non-attendees, and some of those were, "I live too far away to attend so my opinion doesn't matter." Persons who attend, at least occasionally, are your primary survey target.
  - Include a self-addressed, stamped envelope (SASE) for survey replies! Although SASEs are expensive, persons with wide experience in surveys have found that they dramatically improve response rates. (You might consider an e-mail survey; I didn't try it.)
  - When compiling survey results, list program topics in order of number of persons who checked them.
  - Follow the same priority in developing programs.

- *Tie some programs to chapter goals.* Expand the goal of satisfying interests of current members (actually these goals are not mutually exclusive). In 1996, our chapter established a goal to broaden membership diversity. We scheduled a Bell Atlantic speaker on telephone systems. We also scheduled a talk on government versus commercial systems engineering practices. These topics drew attendance as effectively as those developed in the survey process (e.g., "Achieving SEI CMM Level 4," and "Business Process Reengineering").

- *Develop programs facilitating chapter development:* Every June, the WMA Chapter schedules an INCOSE symposium preview. Our chapter has many members who submit papers that are accepted for publication. In March, I ask Ellen Barker of the symposium committee to send me a list of papers accepted from our area (some are from the nearby Chesapeake Chapter). I make up a survey listing the titles and authors. In April, chapter members vote on the papers they would most like to hear (allowing each respondent the same number of votes, about 1/3 or 1/4 of the total number of papers.)

Then I ask the speakers who got the most votes if they want to practice their paper at our chapter meeting—about 2/3 say yes. (As Program Chair, I am pleased to have programs that are a source of excellent, timely, peer-reviewed information. The speakers are pleased that the chapter is interested. Speakers and symposium attendees often benefit from the practice presentation. Perhaps the best payoff is that chapter members who are unable to attend the symposium have the benefit of the local presentation.) I try to schedule 3 or 4 papers for the June meeting (typically, we have last minute cancellation). Each presentation is allocated the time allowed for symposium papers; thus, four 20-minute presentations with 5-minute breaks is 100 minutes. Although longer than our normal programs, these meetings are fun. We are delighted that one of our June speakers won Best Presentation honors at the INCOSE '96 symposium in Boston.

• Be *alert for* new *program opportunities.* It is not necessary to follow the six month program schedule religiously. Our industry is dynamic, and it is not possible to anticipate every opportunity or good idea. If time permits orderly rescheduling, be flexible in exercising discretion as Program Chair. For example, if travel and availability permit, consider asking the author of a symposium Best Presentation to repeat the paper for your chapter in the Fall.

• *Consider program schedule variety.* At first, I started rotating speakers from industry, government, and academia every quarter. A variety of topics also helps to maintain interest. (By the way, use your judgment when asking speakers to present at a June pre-symposium meeting. We had a BPR presentation in May, so even though the April meeting survey indicated strong interest in hearing a BPR presentation in June, I did not ask that speaker, because the paper was too much like the May presentation.)

• *Consider a process topic.* A presentation on "Our Systems Engineering Process" by an industry or government expert, is a consistent big hitter. Try to schedule such programs once or twice a year. Our chapter has particularly enjoyed presentations on DOD and aerospace industry methods. However, unusual systems engineering environments (e.g., Bell Atlantic, financial institutions, consumer product developers) are often quite illuminating.

• *Consider program schedule relevancy.* For example, last April we scheduled a talk on the new IRS computer system. (Unfortunately, that topic fell through, but it would have been such good timing.)

• *Ask chapter officers to help recruit speakers.* In a board meeting, enlist each officer to help with one of the eight or so topics you target to include in the next six meetings (at least two intended programs will fall through.) Usually, each officer will provide at least one good lead.

• *Consider financial resources for some speakers.* Our chapter has never yet paid a speaker; however, we have relied mostly on chapter members and friends of chapter members. Non-members may agree to present a program because they are interested in INCOSE, desire to publicize their company, or enjoy sharing their experiences and points of view. Many, perhaps most, business, governmental, and academic speakers do not expect payment. (However, consider presenting a small memento such as an INCOSE mug and a certificate of appreciation to all speakers.) If you want schedule big names, especially persons who earn a portion of their living as trainers or speakers, payment may be required.

❑ A FEW OVERALL HINTS FOR PROGRAM CHAIRS

• *Get outside the box!* Consider programs that are interesting even if not directly relevant to many systems engineers (see Jerry Lake's column, "Thoughts on a Serious Issue," in this issue). There are many potential sources: Politicians and their ideas regarding privacy, information exchange, or patents. School administrators and their information system needs or transportation system requirements. Highway departments. Biology professors on how organisms display complexity, or how cells differentiate to become bone or muscle or eye tissue. A specialist on application of artificial intelligence. An Internet Service Provider regarding, "Why I think there is a future in my business." A business executive on the tradeoffs executives must make. Someone from NASA, on remote sensing, the future of interplanetary exploration, or technology transfer.

• *Work actively with the chapter board.* If you have ideas, they can help make them happen. If you ask, many board members will help. (But don't expect volunteers, you should ask.) Some boards want to approve the programs, others are delighted if someone is willing to take responsibility and "do good things." However, using surveys and involving chapter officers will help ensure that members are satisfied and board priorities are met (and incidentally make any approval process painless as possible.)

• *First the topics, then the speakers.* Well all right, sometimes the speaker first (and whatever topic on which they wish to speak). However, never scratch a good topic off the list, just because a speaker does not

immediately come to mind. Don't hesitate to make a cold call to a potential speaker. Explain what INCOSE is and why you called. They might say "no," but they might say "yes." All it costs is a phone call and not being too proud to ask (and pride is supposed to be a sin anyway).

STATUS OF THE NEW INCOSE WEB SITE

Randy Case, rcase@esy.com
Chair, Electronic Media Subcommittee (Comm2)

As a DoD contractor, I have always wanted to be on the other side of a Request for Proposal (RFP). No matter how much advance notice or comments on drafts or other preparation are available, the contractor still has a 30 or 45 (or sometimes 60) day fire drill when the real RFP finally arrives.

This past summer I finally got my chance to try my hand at the other side of the process. Now, I'm not sure which side is worse...

With the help of the Electronic Media Subcommittee, and other members of Comm2 (notably Beth Clark, Bill Schoening, Dona Lee, and Pat Hale), an RFP for was assembled for the redesign and maintenance of the INCOSE Web site. We generated a Statement of Work (SOW) with 27 requirements (17 for the redesign, and 10 for maintenance). We also generated terms and conditions (T&Cs) and a schedule of contract items. Lastly, before posting the RFP, we generated 12 instructions for the RFP responses and described the evaluation criteria that we would use to review the proposals. There was nothing out of the ordinary in terms of an RFP (except that it was quite a bit lighter than most that I have seen). After all, there were only 27 requirements. We then uploaded the RFP to our Web site (but did not hook it to the home page). Lastly, we generated an analysis plan for review of the proposals.

After an Internet search for potential designers and webmasters, we posted a short e-mail to 238 addresses and 5 Internet UseNet groups. We then breathed a sigh, relaxed, and waited for the few responses that we were sure that we would get.

Thirty-eight responses later, we knew that we had over-achieved.

The fact that we got so many responses forced us to rip up our carefully thought out analysis plan that assumed that we would get about five responses. So, to Plan 2: Instead of looking at capabilities and how well they met INCOSE needs, we started by analyzing proposed costs and schedules to determine if they matched requirements stated in the RFI?

You would expect anyone who responded to an RFP would take a few minutes to read the requirements, wouldn't you? The first paragraph of the RFP states:

> *INCOSE hereby solicits your Firm Fixed Price proposal for the items specified below. The items requested will be in support of the graphical design and webmaster functions of INCOSE's existing Web site. This does not include hosting the Web site.*

How many of the thirty-eight proposals do you think displayed any understanding of the last sentence? Well, it seems that three webmasters that can only provide service and support if you host on their hardware. (I have no doubt that if I ignored a firmly stated customer requirement in preparing a proposal, my head would soon be displayed on a pikestaff in our company courtyard.)

But, back to the topic. Just about all of the responses met our schedule, so the only remaining first-pass filter that we could apply was cost. Before proceeding with evaluation of the remaining responses, we needed to determine the criterion for the cost-filter decision. We took the current budget, and added 75 percent as our cap. This seems reasonable for the following reasons:

1. In the RFP, we requested that each proposal include an estimate the costs based on changing 60 pages per month.
2. The month before the INCOSE '96 symposium, we changed 56 pages. In the previous month, we changed 39. In the preceding 3 months we averaged 16 changes per month.

Given that we had overspecified the required labor, it seemed reasonable to overspecify our budget. At this point obvious disqualifications had reduced the number of proposals to be evaluated from 38 to 21. Still, we had too many for detailed analysis.

After completing the budget and requirements filtering, we reviewed the home page (or other sample page) of each of the remaining webmasters. This evaluation was then fed into our more formal analysis process. As summarized in notes of the August 5 Comm2 telecon:

> We *will be using a two pass approach. First, a single reviewer will review each proposal to determine if it is compliant with RFP requirements and meets INCOSE needs. If not, it will be disqualified. Other disqualifications include lack of references (at least one proposal fails this test). We will award* higher scores for those who provide multiple, high-quality sites as references.

Our analysis process was based on conventional trade study methods. We scored the remaining 21 sample/home pages on: (1) quality, (2) clarity, (3) speed of download, and (4) ability to project a professional image for INCOSE (which we took to be that of a professional organization such as IEEE or ACM from a Web page point of view). After the first pass was complete, the number of proposals had been reduced from 38 to nine.

The second pass of our approach then scored each of the remaining nine proposals using previously determined criteria. Scores were totaled, and top five for the final detailed evaluation phase.

It was now September 23. We had started evaluation just after the INCOSE '96 summer symposium, with plans to award the contract on the first of September. Clearly, we were taking too long to get to an answer. (I will never again wonder what is taking the Government so long to select the winner from a proposal cycle.) During the Comm2 telecon on September 23, we reviewed the evaluations of each of the five contenders, and selected Emruz Communications as the winner. The following is extracted from the September 24 announcement of the winner:

> The winner of the INCOSE webmaster/graphics development [contract is] Emruz Communications. Their Web site is at: <http://www.emruz.com>
> We were quite impressed with their proposal: Their graphics were smooth, concise, and loaded quickly. They fit our needs in terms of cost, schedule, and handling of both the webmaster and graphics design. They also showed that they understood an "engineering" point of view.
> [As for several] other proposals that we received, they included a sample design.

End of story? Not quite. We still had to transform the RFP, SOW, T&Cs, and schedules into a formal contract. The selection effort was finished on November 4, with both Ginny Lentz and Emruz signing the contract.

So, now we proceed with the real job(the redesign of the INCOSE Web site. Emruz provided ten different first cut designs for Comm2 review. Emruz is now fine tuning several potential designs to reflect our review comments. We hope to have the new design implemented by the end of 1996. Some of the design concepts are being placed on our Web site now, so stop by and have a look at <http://www.incose.org>.

ISO STANDARD 15288, SYSTEM LIFE CYCLE PROCESSES

Dr. Jerome G. Lake, lakejg@smisyseng.com
INCOSE Representative to WG7

The International Organization for Standardization (ISO) is working on a standard called "System Life Cycle Processes," through its Information technology committee, Software subcommittee (SC7), Working Group 7. This group, abbreviated WG7, met in Paris, France during the week of November 9. The WG7 is made up of individuals who were involved in producing the IS0 12207 "Software Life Cycle Processes" standard, plus invited individuals with a system background. In the latter category, I have been appointed to represent INCOSE formally as a "technical expert."

It is my opinion that as a result of this meeting, the software members and the system members now better understand each other's domains and concerns. This understanding, however, by no means assures that the development of the system standard 15288 will be an easy task.

There are several issues to be resolved. One is that the approved requirements document for the 15288 project specifically states that the systems of interest will contain at least hardware, software, and people. This restriction is unacceptable to several WG7 members, national bodies, and some potential users.

Another key issue is that some 12207 (software) members desire that the life cycle processes of 12207 be adopted "in specific" (meaning as a matter of policy) and in principle in 15288. Their position is that the impact on 12207 should be minimized because several nations have already made significant investments to translate and implement 12207.

Several actions were taken: The first is that WG7 approved (after no small amount of discussion) two definitions for 15288:

> **System:** An integrated composite that consists of one or more of the processes, hardware, software, facilities, and people that provide a capability to satisfy a stated need or objective. (Note: This is the same definition of a system found in IS0 12207. The definition highlights processes and software as elements of a system. This is consistent with the title of 12207.)
> **System Life Cycle:** That which begins with the perception of a need leading to realization, utilization, evolution, and eventual retirement.

Second, WG7 approved the following three resolutions:

- Start with a system view for 15288.
- Work with 12207 to see what can be used in 15288.

- Propose to revise **12207 to** remove contradictions with 15288.

Resolution 1 allows 15288 to be formed independent of 12207. Resolution 2 allows for total incorporation of 12207 processes in 15288. Resolution 3 recognizes that 15288 may create the need for 12207 to change to be correct at the interfaces of the two standards, and possibly to harmonize 12207 with 15288.

A third action was agreement in principle with a parallel development of the 15288 standard and an accompanying guide. The estimated publication date for 15288 is the year 2001.

It has taken one year and two international meetings of approximately five days each to come to this point in 15288 maturity. One might say that progress has been rather slow. However, such is the environment of the making of an international standard. For 15288, not only the different national views of such a standard must be considered, but also the software and system paradigms discussed above. Considering this, much progress has been made. The various models and views have been openly discussed. An annotated outline of 15288 has been produced and national comments discussed and resolved, at least in principle.

The next step is national comment on a revised annotated outline based on the Paris discussions and other models presented in Paris. These comments, and national body inputs as to life cycle process scope, activities, and objectives, will be the basis for discussion at the next WG7 meeting in June 1997.

A first working group draft of 15288 is scheduled for November 1997. This draft is, of course, contingent on the varied issues and concerns being resolved by the Working Group during the annual meeting of SC7 in June 1997. This may be optimistic on one hand, but I believe achievable as long as the draft can present several views, not just one.

A more comprehensive explanation of the 15288 development will be provided in a paper being prepared for the August 1997 INCOSE symposium.

Status Report on EIA 632, Processes for Engineering a System

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Dr. Jerome G. Lake, lakejg@smisyseng.com

The EIA Interim Standard 632 is in the final stages of revision to a full EIA standard. This effort began in April 1995. It is a joint project sponsored by EIA, IEEE, and INCOSE. The Technical (writing) Committee representatives are: Richard Harwell (Lockheed Martin)-INCOSE, Dr. Jerry Lake (Systems Management international)—IEEE, and Dr. John Velman (Hughes)-EIA. James Martin (Texas Instruments) is the G-47 (Systems Engineering) lead of the EIA 632 Technical Committee and the Systems Engineering Working Group.

The Technical Committee (TC) met in Los Angeles on Dec 9-11, 1996, to finalize a draft revision of EIA 632 for the Committee Ballot to be held in January 97. The draft will be released to EIA in early January for distribution to EIA, INCOSE, and IEEE for balloting. The drafts of this standard have been through two extensive reviews by the Systems Engineering Working Group made up of EIA, IEEE, and INCOSE members. The ballot version will have incorporated comments from the working group reviews.

Dr. Richard Schwadron (McDonnell Douglas) and Dr. John Snoderly (DSMC) have organized a group of key reviewers to conduct the INCOSE review of the ballot draft. They will be working with key reviewers **at** the INCOSE Winter Business Meeting in Las Vegas to discuss comments.

The final version of EIA 632 is intended to be a top-level standard for processes used in engineering a system. These processes are as follows:

- Acquirer-Supplier Agreement Process-includes both internal (informal) and external (formal) agreements
- Planning Process-enables creation of the engineering plan for the technical effort
- Control Process-enables control of the planned technical effort
- Systems Engineering Process-applied to a building block to convert stakeholder requirements into design solutions for operational products and requirements for enabling associated processes
- System Qualification Process-enables qualifying operational products against development baseline requirememts and enabling proof testing of associated processes

Processes outside the scope of EIA 632, yet important to the success of engineering systems, are also discussed. The scope and objectives of these processes are provided in the standard and include the following:

- Project Processes
  - Project Management
  - Business Management
  - Project aspects of the Aquirer-Supplier Agreement
- Organization Processes
  - Support Infrastructure
  - Resource Management
  - Process Management

- Investment decisions
- Production
- Organization aspects of the Acquirer-Supplier Agreement

EIA 632 is intended be a top-level standard for the engineering of a system. It is expected that second tier standards and guides will be developed for specific technology domains, industry sectors, etc. For example, the IEEE Trial-Use Standard 1220-1994 is a second tier standard to cover the electrical and electronics industry and the SAE 4754 is a second tier guide to cover certification of aircraft in meeting safety regulations.

The plan is to have the Committee Ballot completed by March and the EIA ("Pink") Ballot completed by July. After successful completion of the EIA Ballot, the standard will be considered a full standard. The current published version of EIA IS 632 (December 1995) is an interim standard. After becoming a full EIA standard, the standard will be sent to ANSI for adjudication to determine its eligibility for becoming an EIA / ANSI standard.

There has been considerable coordination with the IS0 15288 effort which is developing a standard on System Life Cycle Processes. IS0 15288 is expected to be released in the year 2001. As 15288 is currently planned, the full EIA 632 standard will be very consistent with the IS0 15288 standard when it is released. It is intended that 632 will be updated as appropriate after release of IS0 15288 and be a candidate for the US implementation of IS0 15288.

FACILITIES SYSTEMS ENGINEERING

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Introduction

A facility is defined as "something created to serve a particular function." In this context, facilities have existed since the emergence of mankind. In the context used here, facilities are defined as "any fixed assets used in the creation of a product or service." A typical "Facility System" is presented in Figure 1. In this context, facilities are not industry sectors but rather the enabling basis for each sector's product or service.

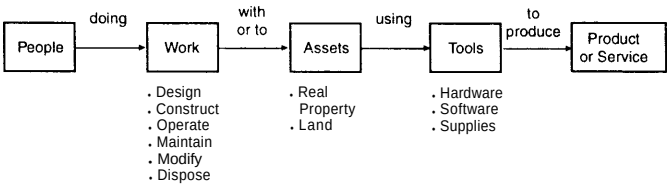

Figure 1. Facility System

From medieval times until the beginning of the industrial revolution, facilities were little more than households that were relatively simple and easily managed. Around the beginning of the 20th century, the complexity of facilities began to increase dramatically. Today, with the use of automation, our facilities have become highly productive and complex.
Risks in this sector include human safety, impact to the environment, quality of product or service and cost containment.

Systems Engineering Challenges

The application of systems engineering to facilities can be broken down as presented in Figure 2.

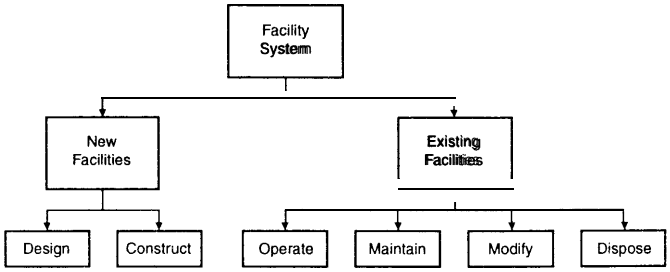

Figure 2. Systems Engineering Application to Facilities

New Facilities

In many government programs, money is appropriated for various facility elements and must be used within a certain time frame. If not used within the allotted time the funding is lost. This forces the applicable effort to be schedule driven with no apparent regard for other dependent element efforts. A recent example of this is the schedule driven design and construction of a building to house a proposed, large, simulator. An early conceptual, subscale version of the simulator was used to predict the full scale simulator dimensions and as a basis for the building design. As the building was nearing completion, it was discovered that the full scale simulator was going to be larger than predicted and would not fit in the allotted space. Consequently, costly rework was required.

In both commercial and government sectors, facilities are usually designed by one team and constructed by another. Such "over-the-wall" design and build causes numerous problems. The current move is toward "design-and-build" teams that offer "turn-key" facilities that are ready for operation at completion.

The challenge to systems engineering is to establish schedules that are event driven rather than events that are schedule driven and to integrate the needed disciplines into the effort.

Existing Facilities

As shown in Figure 2, existing facilities consist of four predominant efforts.

Within the modify effort, the same problems and challenge to systems engineering exist as for new facilities discussed above.

In the operate, maintain and modify efforts, strict configuration control must be emphasized since any change will have some impact. However, operation and maintenance data may indicate the need for changes necessary to make the facility more efficient, reliable, supportable, or capable to meet new requirements. Some of these changes may reduce the cost of operations, operating hazards or impact to the environment.

Many existing facilities were designed and constructed before the advent of systems engineering. Configuration and data management were nonexistent or haphazard. Thus, documentation defining the facilities is neither current nor available. The lack of accurate, complete and current documentation impedes and increases cost of all four efforts.

Until the past few years, the disposal effort was rarely considered. Facilities were abandoned and left to be consumed by natural decay. However, regulation brought about by increased awareness of possible environmental contamination due to some abandoned facilities (e.g., nuclear or chemical plants) forces the disposal effort to be addressed early in the planning phase.

Perhaps the greatest challenge to systems engineers involved in facilities development is the need to convince management that using a systems engineering approach provides added value.

Further Information

For more information on the material discussed here (or to provide comments and suggestions), contact:

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WORKING GROUPS

Applications Forum Working Group Activities

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The Applications Forum Working Group (AFWG) was chartered to "Facilitate the introduction and use of systems engineering principles, techniques, and practices to a wide range of applications in government and private industry; and provide INCOSE a forum to exchange the successful practices that result in high-quality goods and services at affordable and appropriate cost."

The AFWG met on July 9 and 10 at the 6th International Symposium of INCOSE in Boston. We plan to meet in Las Vegas during the week of January 27-31, 1997 to work on unfinished business and to prepare for the summer symposium in Los Angeles.

The AFWG has an approved charter (1/24/96), an aggressive schedule for 1996-97, and a good solid Systems Engineering Applications Profiles, Version **1.0** document (5/1/96), which was released to the INCOSE membership as part of the Volume 2 proceedings in July 1996. The enthusiasm displayed at the symposium by the AFWG members in attendance inspires us to believe that we can continue to achieve our goals. As we come to the end of another year, here is how we did through November 1996.

Goal 1. Establish a charter for the working group
Status: The charter was established and approved by the AFWG membership on July 25, 1995; the charter was revised to reflect the WG name change by the AFWG members in attendance at the INCOSE Winter Business Meeting on January 24, 1996.

Goal 2. Complete and release the Second Draft of the AFWG White Paper
Status: The second draft of the "Applications White Paper" (July 24, 1995) was approved for release by the AFWG on July 26, 1995. The *Systems Engineering Applications Profiles*, Version 1.0, was completed on May 1, 1996 and included in Volume 2 of the 1996 symposium *Proceedings.*

Goal 3. Identify other tangible AFWG work products
Status: The following products have been completed or are planned:

- "Systems engineering Applications Profiles Writing Guide," April 1, 1996 (completed and enclosed as Appendix E of the following document)
- *Systems Engineering Applications Profiles,* May 1, **1996** (Version 1.0 is included in Volume 2 of the 1996 symposium *Proceedings)*
- List of systems engineering applications papers from previous INCOSE symposiums (planned for 1997)
- Summaries of systems engineering applications papers (planned for 1997)
- Case studies of systems engineering applications (planned for 1997)
- List of systems engineering activities and events of other related societies (planned for 1997)

Goal **4.** Conduct two to four systems engineering applications sessions at the 6th Annual International Symposium in Boston, Massachusetts, on July 7-10, 1996, on diverse systems engineering applications
Status: The AFWG maintained contact with Marty Ross, Symposium Technical Chair, throughout the year; four systems engineering applications sessions were conducted at the Boston symposium.

Goal 5. Conduct two additional directed systems engineering applications sessions at the same symposium in topic areas that are growth areas such as the following:

- Highway Transportation Systems
- Environmental Restoration or Natural Resource Management Systems
- Telecommunications Systems

Status: The AFWG members seeded high-quality professional papers in these areas; as a result, three additional sessions were offered for the first time in INCOSE's history as an experiment. These sessions were the following:

- Session **1.1** - Environmental Applications
- Session 2.1 - Transportation Applications
- Session 3.1 - Transportation and Environment

This accomplishment is precedent setting and could not have been accomplished without the cooperation and agreement of the AFWG members who submitted the papers and the Symposium Technical Chair, Marty Ross. The experiment was a success and we hope to continue it in Los Angeles.

Goal 6. Obtain a keynote speaker in one of the above applications areas to promote the changing focus of systems engineering
Status: Although the AFWG claims no credit for this accomplishment, the speakers represented a well balanced program. The excellent speakers were

- Dr. Robert D. Ballard, who led or participated in nearly 100 deep-sea expeditions, is a renowned author of more than 50 scientific articles and has directed prestigious explorations organizations
- Dr. Robert J. Hermann, Senior Vice President, Science and Technology, United Technologies Corporation
- Lester Thurow, economist, author, and educator

Goal 7. Stimulating INCOSE Interest Groups in local chapters such as

- Detroit / Tri-State: Motor Vehicle Systems
- Texas Gulf Coast: Energy Systems
- Chesapeake: Telecommunications Systems
- Washington Metro: Highway Transportation Systems and / or Criminal Justice and Legal Systems
- New England: Health Care Systems
- San Francisco Bay Area: Natural Resource Management Systems

Status: Four Chapters have accepted the challenge and are conducting or proposing programs in their local chapters

Goal 8. Initiate contact with universities that offer systems engineering curricula to gain their participation in the AFWG.

Status: Contacts are underway across the nation with systems engineering students and faculty at universities such as Virginia Tech, George Mason University and the first student chapter at the University of Arizona. Several AFWG members are involved in these activities.

The AFWG board consists of the following members:

1. Chairperson - elected by the membership at the INCOSE Annual Symposium for a two-year term (William Mackey has been elected and agreed to lead the AFWG until 1997.)
2. Co-chairpersons - selected by the elected Chairperson (Carolyn Buford was appointed and has agreed to continue acting in this role.)
3. Secretary - selected by the elected Chairperson (Pat Mackin has agreed to serve temporarily in this role.)

Anyone interested in rolling up their sleeves and supporting the goals and interests of the AFWG may volunteer by contacting William Mackey <wmackey@cscgt.gsfc.nasa.gov> or Carolyn Buford <carolyn.buford@cscgt.gsfc.nasa.gov>.

I thank all of the AFWG members who contributed to the realization of all our goals for 1996, and I hope to see many of you in Las Vegas, at the Winter Business Meeting.

Metrics Working Group

Donna Rhodes, donna.rhodes@lmco.com

The MWG held its Fall meeting on November 18 in Reston, Virginia. Attendees were: Jennifer Dunn, Tellabs; Bill Farr, NSWC / DD; Don Gantzer, Lockheed Martin; Bruce Joren, Harris; John Marshall, NAWCAD (attending from Standards and Handbooks WG); Chuck Mills, Lockheed Martin; Donna Rhodes (Chair), Lockheed Martin; Garry Roedler, Lockheed Martin; Doug Smith, PRC; and Cathy Tilton, NRI. Many thanks to Cathy for hosting the meeting at the offices of NRI.

Patrick Antony of Rockwell is the new co-chair, replacing Bill Miller who has been elected Secretary of INCOSE.

Following a review of the group charter, the first presentation of the meeting was by Don Gantzer on "Synthesis of Metrics Needs for SW CMM 1.1."

Garry Roedler then presented a brief overview of the Practical Software Measurement (PSM) initiative. The MWG has decided to pursue the opportunity to collaborate with PSM to expand the scope from software to systems. This is being explored as an alternative to developing another version or volume of the *INCOSE Metrics Guidebook.*

Bill Farr gave a short status on the IEEE Computer Based Systems metrics group. IEEE CBS MWG and INCOSE MWG also plan to collaborate to ensure there is no duplication of effort.

Donna Rhodes and Bill Farr gave a short update on MIST, the PC-based metrics catalog that is a collaborative effort between NSWC / DD and INCOSE MWG. The MIST prototype is currently being updated, and will be distributed to members in January for review. By the summer symposium, MIST will be available to INCOSE members, most likely, by download from the web.

Jennifer Dunn gave a status on the *Metrics Primer,* indicating it has been updated and is being sent to all MWG reviewers. Planned release is at the Winter Business Meeting.

The meeting concluded with a presentation by Cathy Tilton on "Metrics — Why's, How's and What For's."

MWG is very active with 48 members at present. MWG has been conducting Fall and Spring meetings in addition to Winter and Summer. The interim meetings have been held on the East Coast. MWG is finding that it is difficult for members to travel cross country to these interim meetings. To address this concern, the entire MWG plans to meet at the Winter Workshop and Summer Symposium. For Fall and Spring, there will be an East Coast subgroup meeting (chaired by Donna Rhodes)

and a West Coast subgroup meeting (chaired by Patrick Antony). If possible, the meetings will be held concurrently, so that a telecon summary briefing can be conducted as the final agenda item of the meetings. Donna and Patrick will be working out a detailed strategy and plan, so that the two subgroups can be kept in sync. Patrick is actively seeking participants for the West Coast subgroup; he can be contacted at (310) 922-3697.

Prior to the Winter Workshop, the MWG intends to establish a web page to provide access to MWG products and information, as well as links to related web sites. The Winter Workshop includes a 4-hour training session on PSM and member briefings on particular focus areas. MWG is interested in conducting joint sessions with other WGs during the winter session to discuss topics of mutual interest.

If you are interested in participation in the MWG, please contact Donna Rhodes at (607) 751-6102.

Requirements Working Group

Pradip Kar, pradip_kar@fmc.com

After a series of successful meetings at the 1996 INCOSE Symposium, the Requirements Working Group (RWG) was recognized by the Technical Board for its paper, "Characteristics of Good Requirements." At meetings held during the symposium, plans were prepared for 1996-97 RWG projects.

In response to direction from the Technical Board, the RWG has developed a comprehensive survey to collect data on the cost of errors in requirements. The RWG is now seeking volunteers to respond to this survey. Although the data must be based on actual project experience, responses will be anonymous. The point of contact for the survey is Mack Alford, <alford@netcom.com>.

A Fall meeting, hosted by Texas Instruments, was held in Dallas, Texas, on October 17 and 18. This meeting was devoted largely to working on two of three papers being developed by the RWG during 1996-97. Outlines were developed and writing assignments were made for the following papers:

- "Requirements Tool Interfaces," is being developed under the leadership of Dave Jones, <djones@ti.com>. This paper will provide useful information for requirement tool developers and users related to automated requirements data interfaces.
- "Methods to Determine that a Requirement Set is Complete," development is lead by Pradip Kar, <pradip_kar@fmc.com>. This paper will describe several methods that are part of the requirements analysis process and can be extended to provide tests to check that a requirements set is complete.
- 'Case Studies in Requirements Development," writing is led by George Dew, <G.Dew@ieee.ca>. This paper will identify specific requirements development principles and provide three or four case studies illuminating each principle. Each study will include a statement of the requirement principle being discussed, examples of requirement statements meeting or not meeting the principle; a discussion of project outcomes and recommendations based on requirement management techniques that might be applied in each case; and a summary of what actually happened.

My thanks to all of the working group members whose participation made the Fall meeting a success and to Texas Instruments for their support in hosting the meeting.

A Spring meeting in Minneapolis, Minnesota is tentatively planned to continue work on RWG projects.

Standards and Handbooks Working Group

John A. Marshall, marshallja%am3@mr.nawcad.navy.mil

The last meeting of the Standards and Handbooks Working Group (SHWG) was an executive committee meeting held at INCOSE '96, with Richard Schwadron (Chair), John Marshall (Co-Chair) and John Snoderly (Past Chair). Some concern was expressed that much standards and handbooks activity was being conducted outside SHWG purview (with many past SHWG Chairs involved). Although standards and handbooks activity is good, SHWG ability to cover it with limited membership is not so good. The question of continuing or dropping the SHWG it was raised. However, the consensus was that SHWG is probably one of the more important WGs and should press on. The Chair promised an aggressive agenda.

SHWG has been involved in a number of activities that suggest follow—on actions I suggest that such follow-on activities include the following:

- Initiate a call for SHWG membership
- Obtain a status report on the DSMC Systems *Engineering Management Guide* update effort and offer SHWG contributions.
- Obtain a distilled report of lessons learned from NASA Systems Engineering Improvement Team (SEIT) Meeting October 29-31, 1996.
- Respond to Bryan McCay's call for a Higher Order Systems Engineering (HOSE) view, with the goal of understanding multiple efforts within each WG and how they relate to other INCOSE Technical Committees and WGs. An idea for connecting WGs was suggested in

the Metrics Working Group: Have selected members of a WG establish liaisons with selected members in another WGs. Many times this occurs through natural professional relationships. Sometimes, it happens out of leadership and mutual cooperation among WG Chairs.

- INCOSE should investigate issues related to grading of contractor past performance, in the cost, schedule, and performance paradigm requirement mandated by DoD/USN. Thus far, the practice appears to be engaging more lawyers than system engineers. The lack of a standard or guideline seems a golden opportunity for systems engineers to take a position. System engineers owe it to their lot to avoid a contracting officer solution.

It would be interesting to address some of these issues and have an update on EIA IS 632 progress at the Winter Meeting.

Per INCOSE WG charter and working rules, we are also overdue to hold a SHWG election. SHWG participants and interested INCOSE members should take note: The question may be whether there is a quorum for such an election, or the disbanding of the SHWG may again become a topic for discussion.

Telecommunications Interest Group Activities

Carolyn Buford, cbuford@pop500.gsfc.nasa.gov

The mission of the INCOSE Telecommunications Interest Group (ITIG) is to facilitate the application of systems engineering principles to telecommunications applications, networks, and equipment, to the interpretation of these three elements, and to the dissemination of related lessons learned.

The ITIG is a forum for transferring of information and ideas relating to telecommunications technology and processes; addressing key questions about to applying new or changed telecommunications technology and processes to a variety of business environments; develop a model for use by business; and developing a greater focus on all aspects of the ITIG using available telecommunications tools.

At the Winter Workshop the ITIG plans to develop a charter as the basis for recognition as an INCOSE Working Group, identify current participants, develop a plan consistent with objectives of the working group to recruit additional members, approve the format of the ITIG web page, approve the communication process for establishing the ITIG database, and discuss the draft business model.

If you would like to participate contact Carolyn Buford at <cbuford@pop500.gsfc.nasa.gov> or Kip Klish at <klish@aur.alcatel.com>.

INDUSTRY BRIEFS

Product Development Team Conference

The Center for the Study of Work Teams at the University of North Texas will hold its "5th Advanced Concepts Conference: Product Development Teams" May 14-16, 1997 at the Bristol Suites Hotel in Dallas, Texas. The conference will feature ten leading-edge thinkers presenting research on product development teams. Industry experts will discuss practical applications. For more information on attending this conference, please contact Kathy Belcher at (817) 565-3096.

LOCAL CHAPTER NEWS

Los Angeles Chapter Report

Francis Thompson, fthompson@ccgate.hac.com

The Los Angeles Chapter is addressing the challenge of growing the involvement of its membership while planning for the 1997 INCOSE Symposium. A regular meeting schedule and constant communication helps to maintain momentum. Our objective is to define individual tasks so that chapter work can be shared by all members.

A regular monthly schedule features a range of topics of interest to chapter members. Recent examples are the October 19 tutorial on metrics by Ann Wilbur attended by 40 to 50 persons, the November 18 talk by David Smith which was enthusiastically received, and the December 9 talk by Jerry Lake at a Hughes Electronics facility. All served to provide chapter members with current thinking in systems engineering.

Dates for future involvement in the LA Chapter include the following:

- January 13, Committee Night, where members can meet other members and discuss how to make the chapter work to meet their needs
- January 20, Symposium Planning, where we prepare for the 1997 Symposium
- February 10, Featured Speaker, where we casually mix with one another and enjoy interacting with a speaker who is helping to advance the art of system engineering

San Diego Chapter Report

Ernesto Amaro, ernesto_amaro@mi.sparta.com

On Saturday, November 9, the San Diego Chapter hosted a Region II Mini-conference built on the theme, "Systems Engineering in the Commercial World." The conference was held at Science Applications International Corporation (SAIC) facilities in San Diego.

Registration opened at 8:00 a.m., and presentation of papers began at 9:O0. A morning break permitted discussion with tool vendors exhibiting at the conference. Two additional sessions were devoted to presentation of papers, and the conference adjourned at 3:00 p.m. following a panel discussion.

Scheduled papers included the following:

- "Systems Engineering for Industrial and Commercial Markets," Jack Ring (Central Arizona Chapter)
- "What's in a Name? Systems Engineering in the Commercial World," Brian W. Mar (Seattle Metro Chapter)
- "Hughes Aircraft of Canada, Systems Division (HCSD) Unit Development Process: Step-Wise Process Improvement," Jas Madhur (Vancouver Chapter)
- "Ascent Logic's Next Generation Product Family is Viewed as a Systems Solution," Carol J. Gutierrez (SF Bay Area Chapter)
- "The Quick and Dirty Way to Create a Web Page," Llewellyn (Lew) A. Lee (SF Bay Area Chapter)
- "Systems Engineering Education Demystification: The Saga of Developing a University Certificate Program," Nick Kfoury (Inland Empire Chapter)
- "Systems Engineering Lessons Learned in the Commercial World," Joe Ramirez (San Diego Chapter)
- "Applying Systems Engineering to the Coffee Growing Process," Robert Kane (San Diego Chapter)

Tool vendors planning to exhibit included the following:

- Vitech
- i-Logix
- Ascent Logic
- Vital Link
- TD Technologies

North Texas Chapter Report

Jim Lacy, jimlacy@tdtech.com

The North Texas Chapter of the INCOSE sponsored the Second Annual Tools Fair on November 6, 1996. The scope of the fair, held at the Plano Texas Civic Center, was widened this year to show a variety of tools used by systems engineers in both analysis and project management. Eighteen vendors attended including the following:

- Ascent Logic, modeling and simulation tools
- Aptix, rapid prototyping software
- Alta Group of Cadence, signal processing development tools
- Compliance Automation, tracing and document generation tools
- Integrated Chipware, tracing tools
- Interactive Development Environments, case environments
- Integrated Systems, visualization tools
- i-Logix, control system modeling tools
- Mesa Systems Guild, software systems tools
- Nuthena, behavioral modeling tool
- QSS, tracing tool
- SES, performance modeling and simulation tool
- TD Technologies, systems architecting and management tool
- Visual Numerics, visualization tools
- Vitech, modeling and simulation tool
- Commint, project management tools like Primavera
- Mentor, electronic systems design automation tools

North Texas Chapter Report (continued)

- Several universities offering degrees in systems engineering

The show was well attended by about 130 systems engineering professionals from the North Texas area. We thank the tool suppliers and attendees for making the Second Annual Tools Fair a great success.

Chapter meeting dates for early 1997 are January 7, February 5, March 6, April 8, and May 7. Check on times and locations with any chapter officer. Visitors are welcome, and we do serve food at evening meetings!

Snake River Chapter Report

Norman E. Cole, ncole@inel.gov

Officers of the Snake River Chapter of INCOSE met on Monday December 16, 1996, and scheduled the third Wednesday of each month for regular lunch time meetings. The dates and times of these meetings may be changed to accommodate speakers or special activities.

A January 7 meeting was a special, additional meeting and was held in the LMITCO Engineering Research Office Building. The round-table meeting with Chapter members and special guest speaker, Mr. John Denson, President Lockheed Martin Idaho Technology Company (LMITCO). Discussion centered on INCOSE membership, systems engineering, its value, and its role at a Department of Energy facility. The meeting was part of our membership drive, and the chapter provided free pizza.

Dr. Parviz Rad, a member of the Snake River Chapter and a resident faculty member at the University of Idaho at Idaho Falls, is coordinating the implementation of a systems engineering Masters Degree program. Members of the chapter and the university have worked together to develop the various content elements of this program.

A class of 19 students, and another class of 15 students, have just completed the first systems engineering courses at the University of Idaho in Idaho Falls, Idaho. The classes were taught by Dr. Norm Pendergraft of the University Of Idaho, and by Dr. George Beitel, a member of the Snake River Chapter of INCOSE and a member of the Lockheed Martin Idaho Company Systems Engineering Directorate. During the Spring semester, four additional systems engineering courses will be offered to the Idaho Falls student community.

The requirements and specific courses for this curriculum are in the final stages of development and will be submitted to the Idaho State Board of higher education for approval in April. Interested parties may following progress by visiting our web site at <http://www.if.uidaho.edu/catalog/000engmn.html>.

San Francisco Bay Area Chapter

Jim Whalen, jwhalen@accesscom.com

During the fall, the SFBAC was very active. Our chapter held regular monthly meetings that featured several very informative programs. We completed an update to our chapter's by-laws, which were approved by our membership. We held elections in December: Sue Shreve will guide our chapter through 1997 with the assistance of an excellent group of officers.

Many of our members traveled to San Diego on November 2 for the second Region II mini-conference of the year. There was good participation, and attendees were very pleased with the conference. San Diego is to be congratulated on an excellent program.

We completed the review of the System Engineering Handbook, and thank all those who reviewed it and forwarded comments. Feedback has been very helpful. Copyright release paperwork is in process. We plan to have an approved version ready in time for the INCOSE Winter Workshop.

We continued our series of tutorials with an excellent presentation on Risk Management by Dr. Donald Hurta on November 9. This tutorial was well attended and received excellent reviews.

In 1996 we sponsored three tutorials and plan several for 1997. The monthly programs and tutorials continue to be the focus for our local membership. Barney Morais oversees our tutorial programs. Sue Shreve and Lew Lee have done a great job in setting up monthly programs. The chapter has a growing library of videotapes of these monthly meetings, and Hugh Calvin manages this popular resource. Membership figures and attendance are the true measures of success in these efforts.

To learn more about San Franciso Bay Area Chapter activities, visit our Web page at <http://www.relay.net/~lew/sfbac.html>.

Washington Metropolitan Area Chapter Report

Sarah Sheard, sheard@software.org and Dona Lee, dlee@stratsight.com

The Washington Metro Area Chapter (WMA) has continued with monthly programs on a wide variety of topics. In September, the meeting focused on two systems engineering graduate program theses by students at George Mason University. *Systems Engineering for the Southeast Washington DC Public School Network,* by Kirk Agon was presented by faculty advisor, Dr. Dennis Buede. *Coast Guard Communication System 2000 Network* was presented by the author Max Caruso.

Washington *Area Chapter Report (continued)*

In October, Cathy Tilton gave an "Overview of Systems Engineering Metrics." She has been an active participant in the SE Metrics Working Group.

Sarah Sheard presented the November talk, "Navigating the Compliance Frameworks Quagmire." She highlighted the multiplicity of CMMs, SE standards, quality standards, award criteria, and similar programs with which many organizations try to align their processes.

The WMA Chapter also hosted our second tutorial. As its predecessor in April, it was a great success. Seventy persons heard Dr. Mark Maier of the University of Alabama at Huntsville speak on "Systems Architecting." He offered a multitude of insights that were backed by interesting research results. The WMA Chapter added 33 new members as a result of this meeting! We structure our fees so that it is advantageous to join INCOSE at the time of a tutorial. We also broadcast the tutorial announcements to many locations our normal meeting announcements do not reach.

Chapter officer elections were held in November. The ballot also included a bylaw change to make the Program Chair, Technical Chair, and Membership Chair elected positions with voting rights on the board. At press time, results were not yet available; however, check our Web site at <http://www.vtcorp.com/wma-incose/homepage.html> for the latest list of chapter officers and contacts.

Vancouver Chapter Report

Jas Madhur, jwm@mda.ca and
Yves Lacerte, ylacerte@ccgate.hac.com

On Wednesday, December 4, 1996, the following people were elected to the Board of Directors of the Vancouver Chapter of INCOSE:

President: Robert Taylor, Hughes Canada Systems Division

Vice-President: Philippe Kruchten, Rational Software, Vancouver

Treasurer/Secretary: Yves Lacerte, Macdonald Dettwiler and Associates

Directors at Large:
Jas Madhur, Macdonald Dettwiler and Associates
Kal Toth, WestMost Consortium
Marilyn Parker, Hughes Canada Systems Division
Jeff Joyce, Hughes Canada Systems Division

The Aerospace Corporation is a private, nonprofit company dedicated to meeting national needs through application of experienced technical expertise in space systems. We engage in space systems architecture, engineering, planning, analysis and research predominately for programs managed by the Space and Missile Systems Center of the Air Force Materiel Command.

Systems Engineer

Selected candidates will be knowledgeable in state-of-the-art requirements management processes. Duties include supporting and leading teams in using world-class systems engineering processes for requirements management and specification development, conducting functional analysis, performance analysis, top-level architectural design, requirements allocation and analysis, and identifying design constraints and specification verification methods.

Applicants must have a BS or higher degree in an analytical discipline (e.g., engineering, science, mathematics, computer science, operations research, or systems engineering) and at least 8 years relevant experience. Appropriate experience ranges from broad-based space systems engineering work to experience with all aspects of space-flight hardware design, development, and flight of specific subsystems or payloads. Successful candidates will have proven technical, organizational, planning, communications, and problem solving skills.

System Architecture Analyst

Candidates will support system architecture development activities, such as: assessing user/customer needs, identifying system architecture alternatives, leading trade studies, and assessing architecture mission value, cost, performance, and risk.

Applicants must have a BS or higher degree in an analytical discipline (e.g., engineering, science, mathematics, computer science, operations research, or systems engineering) and at least 8 years relevant experience. Appropriate experience ranges from broad-based space systems engineering work to experience with all aspects of space-flight hardware design, development, operation, or use of specific subsystems or payloads. Successful candidates will have proven skills in using decision support and risk management tools. In addition, the candidate will have proven technical, organizational, planning, communications, and problem solving skills.

Requirements Analyst

A number of positions exist for individuals who will be responsible for using requirements management and systems engineering software tools to support functional analysis and requirements allocation. Duties include developing requirements management databases, parsing documents into systems engineering/requirements management software tools, and training others to use systems engineering/requirements managements software tools.

Applicants must have a BS or higher degree in an analytical discipline (e.g., engineering, science, mathematics, computer science, operations research, or systems engineering) and experience in running software applications on various platforms, especially PCs. Experience in use of database tools is required. Successful candidates will have proven technical, organizational, planning, communications, and problem solving skills. Recent graduates as well as experienced applicants are encouraged to apply.

Cost Research Analyst

We seek candidates in the area of cost research and analysis, cost/performance/design trade studies and cost-risk assessment. Duties include developing space system cost models, researching cost data, and performing statistical analysis to develop cost estimating relationships. In addition, successful candidates will lead interdisciplinary engineering teams to characterize cost/benefit and risk analyses.

Applicants must have a BS or higher degree in engineering, science, mathematics, computer science, or economics. Preferred experience ranges from broad-based space systems engineering work to experience with all aspects of space-flight hardware design, development, and flight of specific subsystems or payloads. Successful candidates will have proven technical, organizational, planning, communications, microcomputing, and problem solving skills.

Competitive compensation and exceptional benefits are offered. Applicants selected will be subject to a security investigation and must meet eligibility requirements for access to classified information.

Qualified individuals should send resumes and salary histories or e-mail to, including position of interest, to: **The Aerospace Corporation, Professional Placement, M1/050, Dept. ZJ9-75, P.O. Box 92957, Los Angeles, CA 90009.** For more information see us on the World Wide Web at: **www.aero.org E-mail: jobs@aero.org** Equal Opportunity Employer.

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(* Emerging Chapters ** Affiliation)

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MEMBERS ON THE MOVE

Dorothy Kuhn

Dorothy Kuhn has left TI to join MCI Telecommunications. She is leading the reengineering of MCI's central switch provisioning system.

Dorothy is Director of Region III for Industry and Product Manager of EPIC's Systems Engineering Capability Maturity Model, which is being merged with the INCOSE SECAM.

Art Pyster

After nearly 10 exciting years at the Software Productivity Consortium, I am moving on to a new position. Beginning January 5, I will be the Chief Scientist for Software Engineering for the FAA. I am very excited about this new opportunity, which will include infusing new software technology into the FAA and leading their software process improvement program.

Other than time in the Army Reserves twenty years ago, this is my first time as a government employee. It will be quite a culture shock moving from a small private company to the federal government, but the chance to influence how the FAA moves into the 21st century will be worth it. The job is in D.C., so I will face a longer commute, but won't have to move my family.

Once I get settled in and have a phone number, mailing address, and email, I will let you know how to reach me.

Mary Redshaw

Mary Redshaw, formerly of SAIC, has joined Battelle as a Senior Research Scientist. She is assigned under subcontract to the Northrup Grumman Team supporting the Office of the Secretary of Defense (Health Affairs) in systems analysis and integration of the Military Health Services System. Working together with the Services' medical community, the Northrup Grumman Team will port the consolidation and modernization of the healthcare data systems which track medical information throughout the Department of Defense.

New contact information is as follows:

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FAX: (703) 575-0316/0317
E-mail: mredshaw@ha.osd.mil

A New *INSIGHT* Column

Announcing "Point-Counterpoint"

LeRoy Botten, lbotten@erols.com
Randy Case, rcase@esys.com

We plan to initiate a new column, "Point-Counterpoint," offering discussion of contrasting views on systems engineering issues and practices. The column will be kicked off by Jerry Lake and Mark Maier in the Spring 1997 issue of *INSIGHT*. Their participation is particularly appreciated since their discussions via the general discussion list of the INCOSE e-mail reflector provided the inspiration for "Point-Counterpoint."

The general discussion list provides INCOSE members with a forum for discussing a wide range of systems engineering topics. Whether one wishes to enter the fray, or just follow threads to gain insight into systems engineering issues and practices, this forum is worth investigating. Randy Case has collected a number of general discussion threads from the the reflector, one of which follows. If you find the following brief thread interesting, you should enjoy "Point-Counterpoint." (If you find it really interesting, further information concerning the discussion list, including how members may subscribe and unsubscribe, are included in "INCOSE E-Mail Reflector Usage." The article is included in the "INCOSE Infrastructure" section of this issue of INSIGHT.)

■ **A** Sample Discussion Thread

The following messages have been edited for continuity. We join the discussion of system size *and complexity* (and related systems engineering issues) already in progress:

Date: Fri, 22 Nov 96 09:16:29 est
From: "ehonour"<EHONOUR@isdlinkl.hisd. harris. com>

Roman Olesnicky says [in a previous message]:
>I agree with Eric - there is no answer.
>I also suggest that there can't be.
>That's what an unprecedented system is.
>But I don't think I agree with him when
>he says this requires some "true academic
>work". I can't see the value of a PhD in
>the estimation of the length of a piece
>of string.

My reason for encouraging academic research in this area is very simple, and it is something that I have said publicly many times: We have no theoretical basis for what we do.

All of the systems engineering standards, processes, metrics, and methods that we use are heuristic in nature. We do for this next job what we personally found worked on the last five jobs, modified by new ideas that we hear from our peers. This *is* a valid way to make forward progress, but it creates fragmented knowledge sets across the world. Worse, it results in our misapplying "knowledge" in a situation where it does not apply, because we do not understand the boundary conditions that made the "knowledge" work the previous five times. Then, we are blindsided by the unforeseen problems and must recover from a disaster.

Afterwards, we scratch our heads and figure out why it *didn't* work this time.. . and we add one more lesson learned to our personal heuristics.

What *are* the parameters that completely define "system size and complexity?" Knowing these parameters may at least allow us to parameterize the conditions under which verious methods work or don't work.

And until someone can find the time to do this research, [...] and prove the results, rather than simply expounding ideas [...] we will be forced to continue with our heuristic approach.

I personally think that it's time, high time, for us to do better.

Eric Honour
ehonour@harris.com

Date: Fri, 22 Nov 1996 08:26:20 -0800 (PST)
From: "B. Mar" <bwmar@u.washington.edu>

Let me **propose a framework for the issue of size and complexity using hierarchy** (trees) and flow diagrams as metrics. Systems engineering is based on a systems view of things that are engineered, and it is the fundamental systems concepts that have a scientific basis. I have proposed that systems must be viewed from four views: functions, requirements, answers, and test. If you take all the information generated during an engineering effort that describes the end product and split them in to these four categories, each pile should be approximately the same size, since they are describing the same system from different perspectives. In reality, they are not because some efforts stress testing into being, others stress the answers (architecture) and systems engineering attempts to develop functional and requirement descriptions that are at least equal to the answer and test information.

If Eric is defining requirements as what I call functions (actions of the system) and requirements (how well functions must be performed) then the first metric is to compare the hierarchy dimensions of the requirement descriptions versus the answer and test information at each step of the end product lifecycle development. If there is not at least a one-to-one relationship, then there are inadequate requirements.

Hierarchies are just a way to define decomposition, it does not describe interaction between elements. Thus both trees and flows are required to describe any view of the system. The requirements tree (Eric's definition) presents the decomposition of whole into parts. The metric that should be used is not the number of parts (requirements), but the number of levels of decomposition (use the rule of seven, and never decompose anything into more than seven parts). Software decomposition tends to be much greater than hardware decomposition.

Flows describe the interaction between parts at any level, the number of inputs and outputs to any part is another dimension of complexity. I will be presenting a paper in LA describing the literature and science that provides the basis for this type of approach to complexity

Brian Mar,
206 543-7941, FAX 206 685-9185
Box 352700,
University of Washington,
Seattle WA 98195

Date: Sat, 23 Nov 1996 05:16:32 +0500
From: "Sam Harbaugh: Palm Bay, Florida" <harbaugh@iu.net>

At 08:26 AM 11/22/96 -0800, B. Mar wrote:
>Hierarchies are just a way to define decomposition, it does not describe
>interaction between elements. Thus both trees and flows are required to
>describe any view of the system.

In contrast, I find that problem domain object classes are very useful for organizing user requirements. Rather than hierarchy, trees, and flows, relationships are defined between the classes. We allocate the user requirements to the these domain classes. Then we can focus our minds on the requirements in one class at a time. I am one of about 6 people doing this with about 4500 user requirements and it seems to make sense and be useful.

>Software decomposition tends to be much greater than hardware decomposition.

I think this is because hardware must obey laws of nature resulting in a universal partitioning criteria. We find that using user domain object classes for user requirement partitioning has somewhat the same effect. The particular domain is military operations and most battle environments are partitioned similarly (equipment, body of water, man made structure, etc.). U.S. forces, friendly forces and opposing forces fall into these same classes. Maybe in Zaire its different :-)

>Flows describe the interaction between parts at any level, the number of
>inputs and outputs to any part is another dimension of complexity.

I suspect that identifying the number of inputs and outputs is premature at the requirements analysis level. In the object-oriented approach I describe, the entity-relationship diagram only identifies that there is an interaction. The specification of the interaction is deferred to software requirements specification.

P.S. Use-Cases are also very useful (no pun intended)

Sam Harbaugh,
Palm Bay, Florida

INCOSE INFRASTRUCTURE

INCOSE E-Mail Reflector Usage

Randy Case, rcase@esy.com

The INCOSE e-mail reflector is composed of two different lists: a general discussion list and an administrative list. Messages posted to a reflector are forwarded to each subscriber on that list.

■ **The INCOSE General Discussion List**

The discussion list provides INCOSE members with a forum for discussion of questions, issues, lessons learned, best practices, research topics, information sources, and other systems engineering topics. The discussion list is fairly active, an average of approximately 30 messages per week have been posted over the past two months. However, taking time to follow the discussion can be quite educational.

Topics discussed during the past few months have ranged from philosophical (e.g., systems engineers as project heroes) to pragmatic (e.g., to the problem of when to quit decomposing requirements to avoid over-specification). Discussions are often thought provoking (e.g., see Jerry Lake's column, "Thoughts on a Serious Issue" in this issue).

INCOSE members may subscribe by sending e-mail to:

<incose-discuss-request@xor.com>

with the following command in the body of your e-mail:

subscribe incose-discuss *your_e-mail_address*

A good rule of thumb is to put the most general e-mail address possible in the above message. For example, if you have an address within your company such as:

My_Name%group%business_unit
@vines.division.company.com

and also a more general address such as:

My_Name@company.com

Please use the second address when you subscribe. (This will reduce reflector server loading by having your company's mail system find you, rather than the list's mail daemon.)

If, for some reason, you wish to be removed from the discussion list, send e-mail to:

<incose-discuss-request@xor.com>

with the following command in the body of your e-mail:

unsubscribe incose-discuss *your-e-mail-address*

To post a message, send an e-mail to:

<incose-discuss@xor.com>

The discussion list is not moderated, and anyone can post to it. There are currently 308 INCOSE members (and affiliates) on the list.

■ The **INCOSE Administrative List**

The administrative list is devoted to announcements of INCOSE and systems engineering related meetings, workshops, publications, and for communication of INCOSE business to the membership. It is a moderated list. Traffic is very light, about one message is posted per month. Every INCOSE member with e-mail is encouraged to subscribe to this list.

To subscribe, send e-mail to:

<incose-admin-request@xor.com>

with the following command in the body of your e-mail:

subscribe incose-admin *your_e-mail_address*

If, for some reason, you wish to be removed from the list, send e-mail to:

<incose-admin-request@xor.com>

with the following command in the body of your e-mail:

unsubscribe incose-admin *your-e-mail-address*

To post a message, send e-mail to:

<incose-admin@xor.com>

There are currently 308 INCOSE members (and affiliates) on the administrative list.

INCOSE Officers

- **President**
  Eric Honour, (407) 242-5192, <ehonour@iu.net>
- **President-Elect**
  William W. Schoening, (314) 234-9651
  <wschoening@gwsmtp01.mdc.com>
- **Past President**
  Ginny Lentz, (860) 727-7301, <lentzva@utrc.utc.com>
- **Treasurer**
  Mike Wood, (206) 657-2565
  <woodm@net.a1.boeing.com>
- **Secretary**
  William D. Miller, (908) 771-2762
  <william.d.miller@att.com>
- **Ways and Means**
  Art Morrison, (206) 657-5703
  <morrisona@a1.boeing.com>

MEMBERSHIP

Lew Lee, lew@svl.trw.com

It has now been a year that I have been your Membership Chair. We have made enormous progress in improving the membership processes-much of it due to Shirley Bishop Incorporated, which provides us with services we now take for granted. In this column, I'll answer the three most-often asked questions concerning membership:

1. What are the benefits of a membership in INCOSE?
2. How big is INCOSE?
3. What resources are available to help me promote INCOSE?

INCOSE Membership Benefits

INCOSE offers a myriad of benefits to help us perform better on our jobs. We have been asking the membership what they value from a membership in INCOSE. Here is the list:

- Network with over 2500 multi-national systems engineering professionals
- Receive ***INSIGHT***, the quarterly newsletter
- Receive Systems Engineering, the journal of INCOSE
- Contribute through INCOSE technical committees and working groups
- Collaborate with experts and practitioners
- Receive the membership directory on diskette
- Lowest prices on INCOSE publications purchases

Often overlooked, a membership in INCOSE goes to support an infrastructure from which we all benefit:

- Annual international symposia and proceedings
- Local chapter operations
- INCOSE World Wide Web and online resources
- INCOSE listservers (for online discussions)
- INCOSE representation on standards committees
- Professionally operated INCOSE office
- Creation of INCOSE products and publications

In addition, every chapter offers a unique set of benefits tailored to their membership. Chapters offer regularly scheduled presentations and opportunities to network and learn. Many chapters have sponsored tutorials, trade fairs, and mini-conferences.

INCOSE Membership

As of November, **1996, we** have approximately 2400 members plus over 170 affiliated members from the Systems Engineering Society of Australia. *Figure 1* shows our steady growth. We have met our membership goal of 2500 by the end of 1996. With increasing interest in chapter startups and a steady record of chartering new chapters, we will be seeing steady growth in the months ahead.

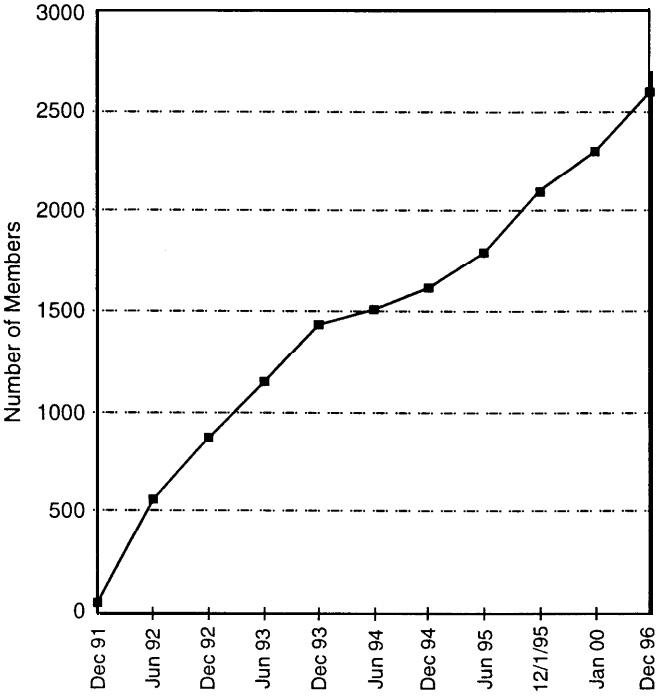

Figure 1. INCOSE Membership Growth

Available Resources

The Central Office and I work hand-in-hand to provide our organization with the materials needed to promote INCOSE and build membership. Would you like a stack of INCOSE trifolds to distribute at an upcoming conference? Contact the Central Office. Interested in starting a chapter? Contact the Central Office. Are you looking for printed material to put into recruiting packets? Contact the Central Office. How about borrowing a 7- or 5-foot INCOSE banner to display at an event? Contact the Central Office. Do you have a request for special support? Contact the Central Office. In the next few weeks, you will begin to see posters promoting systems engineering and INCOSE. We encourage members to place these posters in the workplace to increase the awareness of systems engineermg.

The INCOSE Office can be reached at (800) 366-1164 or (206) 441-1164, by FAX at (206) 441-8262, or by e-mail at <incose@halcyon.com>. I can be reached at (408) 738-2888 (ext 5090) or <lew@svl.trw.com or lew@relay.net>.

INCOSE ONLINE

INCOSE Web Site Statistics

Randy Case, rcase@esy.com

Since I have been involved with the Communications Committee (Comm2 Electronic Media Subcommittee Chair), there has been a steady increase in the use of our Web site, <http://www.incose.org>. Since I discuss the status of INCOSE Web site elsewhere in this issue, I thought that I would share some current usage statistics for the existing INCOSE Web site in this report.

The information in this article is for May and November of this year. The key numbers, including the one that affects the charges to INCOSE, are as follow:

Measure	May	Nov	Delta
Pages transmitted	3292	6144	87 %
Avg. pages/day	106	205	93 %
Avg. home page visits/day	23	40	74 %
Megabytes/month	66	140	112 %

I would call that a healthy increase. (The statistics for the months between May and November show a similar rate of growth.)

For November, the page transfer requests originated within the following domains of the Internet:

% of Total	Pages Sent	Domain	% of Total	Pages Sent	Domain	% of Total	Pages Sent	Domain
46.19	**2838**	US Commercial	0.49	30	Norway	0.08	5	Brazil
17.90	1100	Unresolved	0.39	24	Finland	0.07	4	Denmark
6.02	370	Network	0.37	23	Korea (South)	0.03	2	Singapore
4.82	296	US Government	0.36	22	South Africa	0.03	2	Ireland
4.17	256	US Educational	0.31	19	Belgium	0.03	2	Indonesia
4.13	254	United Kingdom	0.26	**16**	United States	0.03	2	Croatia (Hrvatska)
3.01	185	US Military	0.26	16	Japan	0.03	2	Hong Kong
2.77	170	Non-Profit Organization	0.20	12	Austria	0.03	2	Great Britain (UK)
			0.15	9	Netherlands	0.03	2	Spain
2.64	162	Australia	0.11	7	New Zealand (Aotearoa)	0.03	2	Switzerland
1.29	79	Canada				0.02	1	Yugoslavia
0.99	61	France	0.08	5	Slovenia	0.02	1	Uruguay
0.94	58	Sweden	0.08	5	Mexico	0.02	1	Taiwan
0.81	50	Germany	0.08	5	Israel	0.02	1	Greece
0.70	43	Poland						

And the top pages hit were (only showing those pages with over 100 transfers within the month):

% of Total	Pages Sent	Domain	% of Total	Pages Sent	Domain
3.34	**205**	/about.html	**2.12**	**130**	**/new.html**
1.66	**102**	/benefits.html	2.36	145	/standard.html
2.51	154	/chapters.html	2.67	164	/workgrps/practice/pragprin.html
3.96	243	/hotlist.html	2.73	168	/workgrps/tools/contacts.html
19.56	1202	/index.html	4.17	256	/workgrps/ tools/ tooltax.html
2.28	140	/lib/	2.07	127	/yelopage.html
2.59	159	/lib/sebib.html			

To look at these pages yourself, append them to the INCOSE URL. For example, to look at the Tools Database Working Group's requirements tools survey directly, start with the base address and add the *tooltax* string to it as follows:

<http://www.incose.org/workgrps/ tools/ tooltax.html>

The data for this article was extracted from the monthly report provided by XOR Communications, our Internet Service Provider.

CALL FOR PAPERS

NAECON '97: July 14-18, 1997

IEEE National Aerospace and Electronics Conference

Dayton International Airport • United States Air & Trade Show Pavilion • Dayton, Ohio, USA

In keeping with the theme, "Another Half Century, US Air Force and NAECON," the invited papers session will focus on the where technologies of interest will be in the next fifty years. Topics such as defense conversion and dual use technology also are emphasized.

The Technical Committee invites unclassified papers not previously presented or published in the technical areas listed. However, these technical areas are not all inclusive and should not limit your submission as long as the paper is of interest to the aerospace and electronics community. Implementation and theoretical papers will be collected together within appropriate sessions to stimulate interactions. The Technical Area Chairs are listed and you are highly encouraged to call and discuss prospective topics and papers with the appropriate Area Chair.

- Avionics Systems: Dr. John Hines, Wright lab, WPAFB; (5 13) 2554712 x 413 1; <hinesj@aa.wpafb.af.mil>
- Digital Technology and Applications: Mr. Ron Szkody, Wright lab, WPAFB; (5 13) 255-4264; <szkodyr@aa.wpafb.af.mil>
- Flight Control: Capt. Sharon Heise, Ph.D., AFIT/ENY, WPAFB; (5 13) 255-6565 x464 1; <saheise@afit.af.mil>
- Human System Integration: Dr. Darrel Hopper, Wright Lab, WPAFB; (5 13)255 8267; <hopperdg@bo45mail.wpafb.af.mil>
- Machine Intelligence: Maj. Scott Deloach, Wright tab, WPAFB; (5 13) 255-I 491 x3323; <deloacs@aa.wpafb.af mil>
- Modeling and Simulation: Mr. Jim Totten, Wright lab, WPAFB; (5 13) 255-535 1 x4305; <tottenje@aa.wpafb.af.mil>
- Software Development/Management: Maj. James Skinner, Ph.D., AFIT, WPAFB; (5 13) 476-4500, <jmskinne@lss afit.af.mil>
- Electra-Optics: Dr. Abdul Ahads Awwal, Wright State Univ. (5 13) 873-5 **1** 1 1:<aawwal@valhalla.cs.wright.edu>
- Space Technologies and Applications: Dr. Chris Hall, AFIT, WPAFB; (5 1 3) 255-6565 x4320; <chall@afit.af.mil>
- Engineering of Aerospace Systems: Lt. Col. Stuart Kramer, Ph.D., AFIT, WPAFB; (5 13) 255-6565 x4323; <skramer@afit.af mil>
- Technology Transfer and Insertion: Mr. Richard Jones, Wright lab, WPAFB; (5 13) 255-556 1; <jonesrc@wl.wpafb.af.mil>

Paper Submission Guidelines

Authors are invited to submit three copies of their cleared draft papers (maximum of 20 pages, double spaced, 1 inch margins) by February 3 to:

NAECON '97
Major Ed Pohl
AFIT/ENY
2950 P. St, Bldg. 640
WPAFB, OH 45433

Notification of acceptance of paper will be mailed out by 15 March 1997.

An abstract (500 words) indicating your intent to submit a paper should also be sent to the papers chair no later than December 16, 1996. These abstracts aid in planning. tack of submission of an abstract should not prohibit submission of a paper. In the cover letter please identify the corresponding and presenting authors, authors' names and affiliations, postal and e-mail addresses, and phone and FAX numbers.

Registration Fee

The conference registration fee is $100 for IEEE members and slightly higher for non-members. The first author of each paper gets a free registration, a set of free proceedings, and a free lunch on the day when he presents his paper. All other authors need to pay the registration fee to attend the conference.

Important Dates

Abstract Submission Deadline: (see previous note)	December 16, 1996
Complete Paper Submission Deadline:	February 3, 1997
Author Notification:	March 15, 1997
Camera-Ready Version Due:	April 15, 1997
Conference:	July 14-17, 1997

Web Page

For more information and the latest news, visit the NAECON '97 Web page at:

<http://www.erinet.com/dayieee/NAECON/Welcome.html>.

CALL FOR PAPERS

SAFECOMP'97: September **8-10, 1997**

The 16th International Conference on Computer Safety, Reliability and Security

Sponsor: European Workshop on Industrial Computer Systems Technical Committee 7

Host: University of York, UK

SAFECOMP is an annual event reviewing the state of the art, experiences and new trends in the areas of computer safety, reliability and security. The conference focuses on critical computer applications. It is intended to form a platform for technology transfer between academia, industry and research institutions.

Papers are invited on all aspects of computer systems in which safety, reliability and security are important. Industrial sectors include, but are not restricted to, avionics, space industry, railway and road transportation, process industry, automotive industry, and research. Suggested topics are:

- Safety Assessment
- Safety Guidelines, Standards and Certification
- Formal Methods and Models
- Industrial Applications and Experience
- Issues of Security
- Computers and Environmental Safety
- The Safety Case
- Design for Safety
- Managernent and Development
- Human Factors
- Sociological and Legal Aspects
- Assuring Emerging Technologies

Important Dates and Deadlines

February 1, 1997:	Submission of papers
April 15, 1997:	Notification of acceptance
June 15, 1997:	Final copy of paper required
September 8-l 0, 1997:	SAFECOMP '97

How to Submit a Paper

Send five copies of full papers, clearly showing the name and mailing address, e-mail address, and FAX number of the principal author to the address below. Papers should not exceed 10 pages in length. All submissions will be reviewed by members of the SAFECOMP International Program Committee. The final camera ready paper is required after provisional acceptance by the International Program Committee. Only previously unpublished papers may be submitted. The following declaration should be added to the submitted proposal:

> "All necessary clearances for the publication of this paper have been obtained. If accepted, the author will prepare the final manuscript in time for the inclusion in the conference proceedings and will present the paper at the conference."

For more information on the conference, the full call for papers, and submission instructions visit our Web site at:

<http://www.cs.york.ac.uk/safecomp-97> or contact:

Ginny Wilson
SAFECOMP '97
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University of York
York, Y015DD, UK

Telephone: + 44 1904 432782
FAX: + 44 1904 432708
Email: <safecomp-97@minster.york.ac.uk>

CALL FOR PAPERS

CAiSE '97: June 16-17, 1997

The Doctoral Consortia on Advanced Information Systems Engineering are intended to bring together PhD students within the information systems engineering field and give them the opportunity to present and to discuss their research in a constructive, international atmosphere. The workshop language is English.

The workshop in Barcelona will be the 4th Doctoral Consortium on Advanced Information Systems Engineering of a series held in conjunction with the CAiSE Conferences in Utrecht (1994), in Jyvaskyla (1995), and in Heraklion (1996). The two first days of the CAiSE'97 conference (June 16th and 17th) have been reserved for the Doctoral Consortium.

The CAiSE Doctoral Consortia deal with the topics of the main Conference. In 1997 these topics include but are not restricted to the following:

- Business process reengineering
- CASE
- Conceptual modeling
- Distributed IS design
- Enterprise modeling
- Information systems procurement
- Internet-based IS design
- Internet-based world-wide IS
- Inter-organizational IS
- IS support for virtual organizations
- IT product definition and competitive advantage
- Legacy systems reengineering
- Methods engineering
- Mobile computing
- Object-oriented and rule-based application design
- Quality management
- Requirements engineering
- Reverse engineering
- Workflow management

To apply for participation at the consortium, you must provide five copies of an abstract of your doctoral work to the workshop organizers. Electronic submissions are strongly encouraged (Postscript only). The abstract (restricted to 5000 words) must clearly identify the research question:

- Outline the significant problems in the field of research and the current solutions,
- Present the preliminary ideas and state the proposed approach clearly
- Present the contributions of the applicant and the results of the work

Submissions will be judged on originality, significance, correctness, and clarity. Admission is limited to 20 students.

Important Dates

- Deadline **for submission:** January 30th, 1997
- Notification of acceptance: March 15th, 1997
- Camera-ready paper due: April 15th, 1997
- CAiSE'97 Conference: June 16th-20th, 1997

Contact Addresses

Andreas Winter
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Electronic mail concerning the Doctoral Consortium and submissions should be sent to:
<caise97DC@informatik.uni-koblenz.de>.

The Doctoral Consortium's web-pages are at:
<http://www.unikoblenz.de/~ist/CAiSE97DC/caise97DC.html

CALENDAR OF EVENTS

JANUARY 1997

2 – Space Coast Chapter (SCC) Chapter Meeting
Topic: TBD
Time: 5:30 - 7:00 pm
Place: Patrick AFB Officer's Club, Cocoa Beach, Florida
Contact: Tom Palmer, (407) 690-0801, <lmsrs@iu.net>

7 **– Snake River Chapter Meeting**
Topic: Round Table discussion with John Denson, President Lockheed Martin Idaho Technology Company (LMITCO) concerning INCOSE membership, Systems Engineering, their value, and their roles at a DoE facility
Time: 11:30 am (lunch provided by Chapter)
Place: LMITCO Engineering Research Office Building, Conference Room 159
Contact: Sue Shreve, (415) 506-6398
< sshreve@us.oracle.com >

9 **– Midwest Gateway Chapter Meeting**
Topics: New Officer Installation; and Talk by Bill Schoening, "Seven Questions for Penetrating Technical Fog"
Time: Social Hour 5:00 - 6:00 pm, Dinner 6:00 - 7:00 pm, Program 7:00 - 8:00 pm
Place: Yacovelli's Restaurant, 407 Dunn Road, St. Louis
Contact: Bob Scheurer, <rscheurer@mdc.com>

13 **– Los Angeles Chapter Meeting**
Topic: Committee Meeting Night
Time: 6:00 - 8:00 pm
Place: TBD
Contact: Susan Jones, (310) 336-8576

14 **– San Franciso Bay Area Chapter Meeting**
Topic: TBD
Time: 5:30-7:00 pm
Place: GTE Government Systems in Mountain View
Contact: Sue Shreve, (415) 506-6398
< sshreve@us.oracle.com >

15 **– INCOSE Chesapeake Chapter Meeting**
Topic: Don Schaefer, Senior Associate at Booz, Allen and Hamilton will speak on "Concept Visualization." Concept Visualization is a new systems engineering technique being used to capture user needs and requirements. Don is leading a team developing this concept, a blend of old fashioned requirements data gathering and the use of state-of-the-art multi-media tools. The technique provides a visual representation of a system concept, idea, interface, or explanation. The methodology involves the eventual system user as an integral member of the systems development team. It has been applied to over two dozen projects in the past two years.
Time: 6:00 pm Dinner, 6:30 pm Meeting
Place: Johns Hopkins University Applied Physics Lab
Contact: Ed Cobb, (410) 765-4853,
<cobb.ed@postal.essd.northgrum.com>
Register by January 14 for light dinner (Free to first time guests)
Maps & Directions at: <http:/ /www.incose.org/chapters/chesapek/meetings.html>

20 – Los Angeles Chapter Meeting
Topic: Symposium Planning Meeting
Time: 6:00 - 8:00 pm
Place: TBD
Contact: Judith Peach, (310) 336-8243

21 – Tri-Cities Chapter Meeting
Topic: INCOSE Membership
Time: 5:30 - 7:00 pm
Place: TBD
Contact: Dick Cramond, (509) 946-7090
<dick_cramond@out.trw.com>

27-31 **INCOSE Winter Workshop**
The 1997 Winter Workshop (by invitation only) is jointly hosted by the Silver State and Inland Empire chapters, and will take place in Las Vegas, Nevada. Registration has been extended to January 15. To register for the workshop contact John Clouet <john_clouet@notes.ymp.gov> or Ken Ashlock <kenneth_ashlock@notes.ymp.gov>. FAX contact is Ken Ashlock at 702-794-7809.

FEBRUARY 1997

4 **– Space Coast Chapter (SCC) Chapter Meeting**
Topic: TBD
Time: 5:30 - 7:00 pm
Place: Patrick AFB Officer's Club, Cocoa Beach, Florida
Contact: Tom Palmer, (407) 690-0801, <lmsrs@iu.net>

7 **– North Texas Chapter Meeting**
Topic: IEEE Architecture Standard, Ron Wade (Raytheon/E-Sys terns)
Time: TBD
Place: TBD
Contact: Any chapter officer for time and place

10 **– Los Angeles Chapter Meeting**
Topic: Speaker Meeting (topic TBD)
Time: 6:00 - 8:00 pm
Place: TBD
Contact: Dr. Robert Shishko, (818) 354-1282

11 **– San Francisco Bay Area Chapter Meeting**
Speaker: Hal Mooz from Center for Systems Management (topic TBD)
Time: 5:30-7:00 pm
Place: GTE Government Systems in Mountain View
Contact: Sue Shreve, (415) 506-6398, <sshreve@us.oracle.com>

February 1997 (continued)

18 – Tri-Cities Chapter Meeting
Topic: TBD
Time: 5:30 - 7:00 pm
Place: Richland Public Library
Contact: Dick Cramond, (509) 946-7090,
<dick_cramond@out.trw.com>

MARCH 1997

4 – Space Coast Chapter (SCC) Chapter Meeting
Topic: TBD
Time: 5:30 - 7:00 pm
Place: Patrick AFB Officer's Club, Cocoa Beach, Florida
Contact: Tom Palmer, (407) 690-0801, <lmsrs@iu.net>

6 – North Texas Chapter Meeting
Topic: Panel Discussion on System Engineering Department Startup, Jim Lacy (Moderator) and Panelists from TI, Raytheon / E-Systems, MCI, DSC, and Loral
Time: TBD
Place: TBD
Contact: Any chapter officer for time and place

11 – San Francisco Bay Area Chapter Meeting
Topic: TBD
Time: 5:30-7:00 pm
Place: GTE Government Systems in Mountain View
Contact: Sue Shreve, (415) 506-6398
< sshreve@us.oracle.com >

11 – Space Coast Chapter (SCC) Engineering Seminar
Topics: Prototyping, requirements generation and control, software development, system engineering case studies, and other systems integration topics
Time: 9:00 am - 5:00 pm
Place: Patrick AFB Officer's Club, Cocoa Beach, Florida
Contact: Tom Palmer, (407) 690-0801, <lmsrs@iu.net>

APRIL 1997

8 – North Texas Chapter Meeting
Topic: "IPD and Systems Engineering," Randy Case
Time: TBD
Place: TBD
Contact: Any chapter officer for time and place

8 – San Francisco Bay Area Chapter Meeting
Topic: TBD
Time: 5:30-7:00 pm
Place: GTE Government Systems in Mountain View
Contact: Sue Shreve, (415) 506-6398
< sshreve@us.oracle.com >

COLUMNISTS

The Information ByWay

Jack Fisher, seajnf@aol.com

In the last issue of ***INSIGHT*** I wrote about sources for publications that I have used recently. This column concludes the discussion of those resources.

The US Air Force Software Technology Support Center (STSC)
STSC is located at Hill Air Force Base in Utah and offers a number of software-related products and services. Its mission is to assist Air Force organizations in identifying, evaluating, and adopting technologies that will improve the quality of software products, efficiency of software development, and predictability of developmental cost and schedule. STSC publishes Crosstalk, The Journal of Defense Software Engineering, as well as a number of reports and documents on software engineering. Orders can be placed at (801) 777-7411.

NASA Goddard Space Flight Center Software Engineering Laboratory (SEL)
SEL is an organization, created in 1976 by NASA, Computer Sciences Corporation, and the University of Maryland. SEL investigates the effectiveness of software engineering technologies in developing applications software. It publishes a number of software reports that are summarized in the Annotated Bibliography of Software Engineering Laboratory Literature. Key documents can be browsed by visiting the SEL Web page at <http:/ /fdd.gsfc.nasa.gov:80/seldocreqs.html>. Inquiries and orders may be placed via e-mail to < seldocs-request@listserve.gsfc.nasa.gov> or writing to Software Engineering Branch, Code 552, GSFC, Greenbelt, MD 20771.

American Institute of Aeronautics and Astronautics (AIAA)
The AIAA publishes and makes available a number of textbooks, technical books and reports, and a few standards. AIAA publishes an annual catalog. Orders can be placed by calling (800) 682-AIAA.

American Society for Quality Control (ASQC) Quality Press
The ASQC administers the Malcolm Baldrige Quality Award for the National Institute of Standards and Technology and is the US publisher of IS0 9000 Quality Standards. ASQC also publishes and sells books under the Quality Press imprint. It prints a catalog several

times a year with many titles in total quality management, reliability, quality, statistical process control, inspection, and related topics. Books may be ordered at (800) 248-1946.

Quality Resources
Another publisher with many quality titles is Quality Resources. It publishes a number of books on Baldrige Award strategy and IS0 9000 quality requirements. Orders may be placed at (800) 247-8519.

Krieger Publishing Company
Krieger, located in Melbourne, Florida, specializes in out-of-print technical books, although they are now soliciting original manuscripts. The Krieger catalog lists many books in all fields of engineering. The direct order line is (407) 727-7270.

RAND Corporation
RAND, located in Santa Monica, California, is a nonprofit institution devoted to the research and analysis of public policy issues. Project Air Force within RAND is a federally funded research and development center (FFRDC) devoted to the analysis of operations, technology and resource management for the US Air Force. RAND also operates the Arroyo Center, an FFRDC, for the US Army. Many research publications are available directly from RAND. It publishes a number of bibliographies covering such subject areas as logistics; space technology and planning; R&D; and methods, techniques, and theory for systems acquisition and systems analysis. A Web page, located at <http://www.rand.org/>, provides a listing of available documents. Orders can be placed by phone at (310) 451-7002 or by e-mail at <order@rand.org>.

Other Publishers
I also order a number of books directly from publishers when they are not available in bookstores. The following is a list of publishers and phone numbers that I have used recently:

Cambridge University Press, (800) 872-7423
Cornell University Press, (607) 277-2211
Dorset House, (800) 342-6657
Harper Collins, (800) 331-3761
Harvard Business School, (800) 545-7685
Irwin, (800) 634-3966
Microcosm, (310) 539-9444
Penn State Press, (800) 326-9180
Prentice Hall, (800) 947-7700
Wiley/Interscience, (800) 879-4539

Thoughts on a Serious Issue

Jerry Lake, lakejg@prime.planetcom.com

This article is motivated by two reasons. First, after having had the pleasure of serving NCOSE/INCOSE as an officer and director for over six years, I am pleased to pass the baton to younger and more energetic leaders. It is my opportunity to thank the many who have contributed to the origin and continuance of the Council. Second, I am concerned about a serious issue facing INCOSE leadership and the membership. The new leadership must resolve this issue. That issue is discussed below.

Last fall, there was a series of e-mail messages on career profiles for system engineers. The discussion ran the gamut from offering specific profiles to refuting the existence of such careers. Career discussions of whether systems engineering is a discipline, whether INCOSE should focus on the engineering of a system, or what a system engineer does are at best moot.

We do have *career* system engineers, and that fact must be dealt with. It just so happens that system engineers come in many colors, including software system engineers, hardware system engineers, architects, analysts, requirements managers, environmental engineers, civil engineers, aerospace engineers, electrical engineers, mechanical engineers, medical engineers, naval engineers, information systems system engineers, and many more. As INCOSE has grown the perception of kinds of system engineers has expanded considerably. The commercial world brings a whole new view since many do not even use the term, but the functions needing to be done in engineering a system are in fact accomplished, and accomplished well in most cases.

NCOSE/INCOSE is probably guilty of fostering the very problem that these discussions on careers have fostered. First, it was the goal of the founders to enhance the education of individuals who could do systems engineering. Some of the founders (academics) read this as support for their systems engineering programs. Others (not in a systems engineering department) looked at it as an opportunity to provide ALL engineering students a systems engineering familiarization. The standards world of Mil-Std 499B, EIA/IS 632, and IEEE 1220 brought interest and support from NCOSE. These standards are definitely not what a system engineer does (although they may be assigned major roles in accomplishing the tasks in the standards). Both standards make clear statements of this in the FORWARD.

Yet, as NCOSE grew and became INCOSE, members came from mainly systems engineering organizations or

folks that had systems engineer titles. This is much different from the founders who, although some had such titles, were practicing the big picture approach of what systems engineering originally was meant to be. The textbooks or books on systems engineering (as well as the standards) bear this out-past ones and current ones. Although, software systems engineering books do tend to focus on what a software engineer does-they generally do not focus on the bigger picture of the system in which software is embedded (beyond the computer). This, of course, derives from the information systems world where software and computers are the major components. In this context it is the proper perspective.

What is the future of all this? Well the problem is not going to go away. Leaders in INCOSE must step up to the problem. It is essential that it be addressed. Besides engineering of systems others have created integrated product development, process development, and concurrent engineering to avoid the tendency to focus on discipline, rather than the systems engineering or engineering of a system. Of course those other concepts also brought new baggage to the table--especially concurrent engineering, which was adopted to sell the QFD, design of experiments, and statistical process control approach to engineering a system, with the focus on manufacturing. Then the CALS group jumped on CE and made it CE/CALS so that logistics would not be left out. One can soon figure out that when you get people involved they want to ensure that their discipline gets recognition and holds its place in the sun. Incidentally, value engineers are now looking to become part of systems engineering as are reliability engineers and others such as those in quality assurance. Folks in career fields created in the past to fix problems now find themselves with less purpose because of integrated product teams or changing times. Finding themselves in a declining career field, they tend to move to where the action is. There must be a rule: when a career discipline starts to ebb, folks look for a high flyer to attach themselves to or adopt so they can get in on the action and survive.

The founders wanted NCOSE to be big enough for all engineers to be involved. And not just engineers, but anyone with an interest or investment in the practice of world class systems engineering. We have had several founders and at least one president without an engineering degree. We have not been corrupted by this as far as I know. Although, sadly, many of those who did not have degrees but sat in corporate headquarters responsible for the engineering of systems (called systems engineering) are no longer active in INCOSE. Many of these were the drivers in founding NCOSE.

So, we must acknowledge that we have a diverse group, be thankful for each perspective, and organize our efforts accordingly. Driving the solution towards one group or another will only hurt the future of INCOSE as it was originally envisioned.

Now, a recommendation for the career profile folks. We have over 2500 members. That is quite a sample group. A well-posed questionnaire can determine the profiles of those members from which generalizations can be made about career paths. A good thesis topic for a graduate student. Analysis may also illuminate what system engineers are wont to do or be identified with. Wouldn't it be great if we applied systems engineering to the problem!

This is a message from one of the founders-an aerospace engineer (by degree), a pilot (at 40,000 feet one has a great big-picture view), a math professor, an engineering and project manager (by practice), a business school dean, a systems engineering professor, and a systems engineer (from the 40,000 feet viewpoint).

Now to give everyone something else to think about, "Why is the word abbreviation so long?"

Providing a complimentary copy of ***INSIGHT*** to potential members is a great way to introduce then to your chapter and the organization.
For extra copies, contact the Central Office:

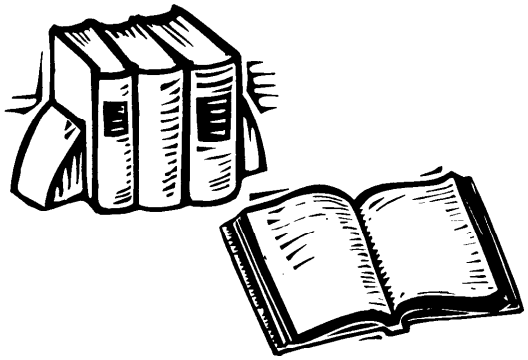
INCOSE
2033 Sixth Avenue, Suite 804
Seattle, WA 98121

Phone: (800) 366-1164
Email: incose@halcyon.com
Fax: (206) 441-8262

BOOK REVIEWS

*The **Stuff Americans** Are Made Of*
by Josh Hammond and James Morrison.
Published by Macmillan Publishing Co.,
Old Tappan, NJ. ISBN 0-02-860829-I

Reviewed by Ivy Hooks, Compliance Automation, Inc., cai@tlmworks.com



Having spent the last nine years of my life trying to get people to understand the importance of writing good requirements from the beginning of a program, I was somewhat appalled to read a statement from The *Stuff Americans Are Made Of.* A reference to the book in the business section of the Houston Chronicle listed the seven cultural forces that define Americans-one of which was the *OOPs factor:* We Americans don't like to do things right the first time. We like to fix things.

I promptly bought the book, assuming that if this is the way we think, then my battle is really uphill!

I read the OOPs chapter first, but having read the entire book, I believe there is much in it that relates to problems faced by system engineers. The book covers seven cultural forces that define Americans and contrasts our behaviors with those of the Germans and the Japanese. It cites examples of companies and projects that suffered from misuse of cultural forces. It also provides examples of companies that have learned how to apply such forces to increase their productivity. The seven cultural forces are as follows:

1. An insistence on choice
2. The pursuit of impossible dreams
3. Obsession with big and more
4. Impatience with time
5. Acceptance of mistakes (the OOPs factor)
6. The urge to improvise
7. Fixation on what's new

Do I have your attention? Not only do the authors address each force and what it means to those trying to improve productivity, but they relate the combinations of these forces and their effects. They give examples of projects that reflect the problems created by the forces—the Hubble Telescope is covered as acceptance *of mistakes.* The authors then discuss how very successful companies approach cultural forces and overcome the associated problems.

Specifically related to our system engineering effort is a discussion in the *impossible dreams* chapter. There is no doubt that Americans have had impossible dreams and impossible successes. Then why are so many of our dreams unrealized? The authors say it is because we fail, repeatedly, to communicate our dreams, our visions, our plans to the whole team. They cite the example of Allied Signal. How its president understood this need, what he did to communicate his dream to his company, and the significant performance improvements and profits that have resulted from his approach.

Also in the impossible dream chapter they discuss a model for dream fulfillment, called *LEAP,* which stands for:

L Where do you want to land?
E What currently exists?
A What are the necessary actions?
P What processes will be engaged?

This sounds to me a great deal like what we, as system engineers, must do each time we encounter a problem, start a project, and analyze requirements. But this book gave me fresh insight into the process and more ideas as to what can be done.

The discussion of people, in the people, processes, and tools triad, is one that we tend to avoid because it is so difficult. This book, more than anything else I have read, helps explain why the people portion is so difficult and provides information to help to cope with that part of the problem. It was also fun to read.

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There are over 15 emerging chapters in addition to the chartered chapters listed. Please contact the ***INCOSE*** Central Office to learn about a developing chapter in your area.

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rev. 6/96

About INCOSE

INCOSE is a professional organization of systems engineers and others interested in systems engineering. The purpose of INCOSE is to foster the definition, understanding, and practice of world class systems engineering in industry, academia, and government. Over 2500 INCOSE members reside in the United States and more than ten other countries. Over twenty local chapters across the United States are joined by chapters and emerging chapters in the UK, Europe, Canada, and affiliated organizations in Australia. The INCOSE Board of Directors consists of six elected officers (a president, past president, president-elect, secretary, treasurer, and director-at-large), ten regional directors from the five US regions, one at-large-director, and two representatives of the Corporate Advisory Board. Nineteen companies support INCOSE as Corporate Advisory Board members by providing representation, an initial donation, and sustaining donations.

INCOSE Central Office

The Central Office staff answers general questions; and accepts membership applications, address changes, and publication orders. Contact the INCOSE office as follows:

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INSIGHT Information

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Submissions

All submissions should include author's name, e-mail address, and telephone number. Send e-mail submissions to <insight@software.org>. Questions concerning ***INSIGHT*** submissions and alternative submission formats should be addressed to the Chief Editor.

Chief Editor

INSIGHT seeks articles on a broad range of systems engineering topics. Requests for permission to reprint, and any other general or policy questions related to INSIGHT, should be addressed to the Chief Editor. The Chief Editor also edits all portions of ***INSIGHT*** not specifically mentioned in succeeding paragraphs and may be contacted as follows: LeRoy Botten, <lbotten@erols.com>, (301) 985-8726.

Chapter Report Editor

Chapters are invited to submit articles (typically, 150 to 200 words) describing accomplishments and recent events for each issue. Information about upcoming events including topics, speakers, place, time, and contact (name, phone, e-mail) are also invited for the "Calendar of Events." Please forward chapter newsletters to the chief editor and the chapter report editor so that articles of general interest can be selected for republication in INSIGHT. Questions concerning chapter reports and calendar content may be directed to James Sanchez, <jsanchez7@msmail4.hac.com>, 310-334-2089.

Book Review Editor

Would you like to share your views on a recent book related to systems engineering? Write a review for ***INSIGHT***. In the body of the review, include the title of the book, the name of the authors, ISBN number, the publisher, the suggested single-copy price, and number of pages in the book. Publishers are invited to submit complimentary copies of books they would like to see reviewed in ***INSIGHT*** to the Central Office; however, reviews are not guaranteed. Book reviews are generally one-half page in length, and the reviewer bears responsibility for purchasing the book (unless a complimentary copy is available). Direct questions concerning book review content to Ann Larmore, <alarmore@rch129.eld.ford.com>, (313) 248-6472.

Advertisement Editor

INSIGHT welcomes systems engineering related advertisements. The revenue generated is used to offset the cost of producing and distributing this newsletter. Ad sizes and prices are as follows:

Full Page:	9.75" by 7.50"	$800
Half Page:	4.50" by 7.50"	$500
Quarter Page:	4.50" by 3.50"	$300
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Discounts are available for companies or individuals who commit to four consecutive issues. A note of commitment is requested to receive the 20 percent discount. The ad size and content may vary for each issue.

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Payment policy, and other advertisement information may be obtained from Valerie Gundrum, <valerie.gundrum@ lmco.com, (607) 751-2245,

Dysfunctional Flow/Stan Long

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